



# INNOLUX DISPLAY CORPORATION

## MT215DW01 V.3 LCD MODULE SPECIFICATION

( ) Preliminary Specification

(●) Final Specification

Customer

Sharp

Innolux:

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# INNOL X DISPLAY CORPORATION

## MT215DW01 V.3 131 LCD MODULE SPECIFICATION

( ) Preliminary Specification

(●) Final Specification

Department

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[illegible]

|                                         |    |
|-----------------------------------------|----|
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**A. General specification**

| NO. | Item                       | Specification                            | Remark |
|-----|----------------------------|------------------------------------------|--------|
| 1   | Display resolution (pixel) | 1920(H) X 1080(V), Full HD resolution    |        |
| 2   | Active area (mm)           | 476.64(H) X268.11 (V)                    |        |
| 3   | Screen size (inch)         | 21.53 inches diagonal                    |        |
| 4   | Pixel pitch (mm)           | 0.24825(H) X0.24825 (V)                  |        |
| 5   | Color configuration        | R, G, B vertical stripe                  |        |
| 6   | Overall dimension (mm)     | 495.6(W) X 292.2(H) X 9.8(D) (typ.)      |        |
| 7   | Color Gamut                | 70%                                      |        |
| 8   | Weight (g)                 | 1600g                                    |        |
| 9   | Surface treatment          | Anti-Glare, Haze=25%, Hard coating (3H)  | Note 1 |
| 10  | Input color signal         | 8 bit LVDS                               |        |
| 11  | Display colors             | 16.7M (6 bit with Hi-FRC)                |        |
| 12  | Optimum viewing direction  | 6 o'clock                                |        |
| 13  | Backlight                  | White-LED                                |        |
| 14  | Others                     | TCO 5.0 & RoHS & Halogen Free compliance |        |

Note 1: Glare Option.

Note 2: Only Anti-Glare can meet TCO 5.0

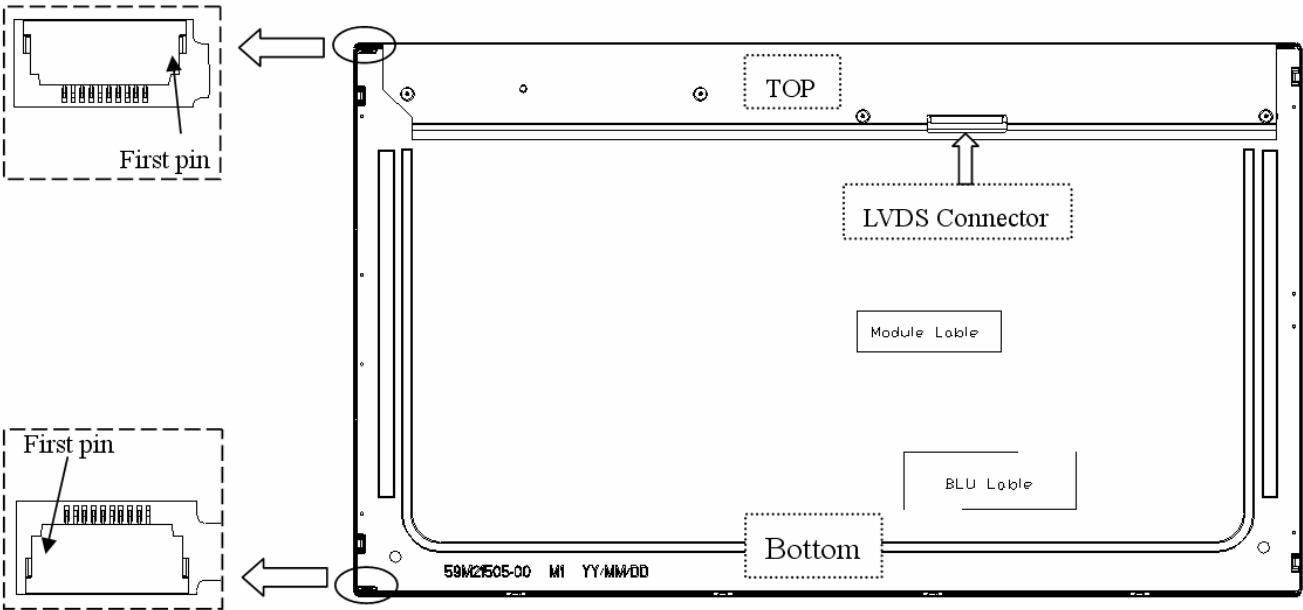
**B. Electrical specifications**

## 1. Pin assignment

## Connector

FOXCONN GS23302-0011 R-7F or mechanical interface equivalent connector.

| Pin No | Symbol  | Description                                |
|--------|---------|--------------------------------------------|
| Frame  | VSS     | Ground                                     |
| 1      | RXinO0- | -LVDS differential data input, Chan 0-Odd  |
| 2      | RXinO0+ | +LVDS differential data input, Chan 0-Odd  |
| 3      | RXinO1- | -LVDS differential data input, Chan 1-Odd  |
| 4      | RXinO1+ | +LVDS differential data input, Chan 1-Odd  |
| 5      | RXinO2- | -LVDS differential data input, Chan 2-Odd  |
| 6      | RXinO2+ | +LVDS differential data input, Chan 2-Odd  |
| 7      | VSS     | Ground                                     |
| 8      | RXOC-   | -LVDS differential Clock input (Odd)       |
| 9      | RXOC+   | +LVDS differential Clock input (Odd)       |
| 10     | RXinO3- | -LVDS differential data input, Chan 3-Odd  |
| 11     | RXinO3+ | +LVDS differential data input, Chan 3-Odd  |
| 12     | RXinE0- | -LVDS differential data input, Chan 0-Even |
| 13     | RXinE0+ | +LVDS differential data input, Chan 0-Even |
| 14     | VSS     | Ground                                     |
| 15     | RXinE1- | -LVDS differential data input, Chan 1-Even |
| 16     | RXinE1+ | +LVDS differential data input, Chan 1-Even |
| 17     | VSS     | Ground                                     |
| 18     | RXinE2- | -LVDS differential data input, Chan 2-Even |
| 19     | RXinE2+ | +LVDS differential data input, Chan 2-Even |
| 20     | RXEC-   | -LVDS differential Clock input (Even)      |
| 21     | RXEC+   | +LVDS differential Clock input (Even)      |
| 22     | RXinE3- | -LVDS differential data input, Chan 3-Even |
| 23     | RXinE3+ | +LVDS differential data input, Chan 3-Even |
| 24     | VSS     | Ground                                     |
| 25     | NC      | No Connection                              |
| 26     | NC      | No Connection                              |
| 27     | NC      | No Connection                              |
| 28     | VCC     | +5.0V power supply                         |
| 29     | VCC     | +5.0V power supply                         |
| 30     | VCC     | +5.0V power supply                         |
| Frame  | VSS     | Ground                                     |



Rear View of LCM

1.2. Recommend Connector for Backlight Unit

This connector is mounted on the monitor system board for LED light-bar FFC mating.

|                            |                           |
|----------------------------|---------------------------|
| Connector Name/Designation | Match Connector           |
| Manufacturer               | Entery INDUSTRIAL CO.,LTD |
| Mating type part number    | 7080-Q10N-00R             |

### 1.3 Light-bar Connector Pin Assignment

#### Upper Light-bar Connector Pin Assignment:

| Pin No | Symbol | Description                    |
|--------|--------|--------------------------------|
| 1      | IRLED1 | LED current sense for string 1 |
| 2      | IRLED1 | LED current sense for string 1 |
| 3      | IRLED2 | LED current sense for string 2 |
| 4      | VLED   | LED power supply               |
| 5      | VLED   | LED power supply               |
| 6      | VLED   | LED power supply               |
| 7      | VLED   | LED power supply               |
| 8      | IRLED2 | LED current sense for string 2 |
| 9      | IRLED3 | LED current sense for string 3 |
| 10     | IRLED3 | LED current sense for string 3 |

#### Lower Light-bar Connector Pin Assignment:

| Pin No | Symbol | Description                    |
|--------|--------|--------------------------------|
| 1      | IRLED1 | LED current sense for string 1 |
| 2      | IRLED1 | LED current sense for string 1 |
| 3      | IRLED2 | LED current sense for string 2 |
| 4      | VLED   | LED power supply               |
| 5      | VLED   | LED power supply               |
| 6      | VLED   | LED power supply               |
| 7      | VLED   | LED power supply               |
| 8      | IRLED2 | LED current sense for string 2 |
| 9      | IRLED3 | LED current sense for string 3 |
| 10     | IRLED3 | LED current sense for string 3 |

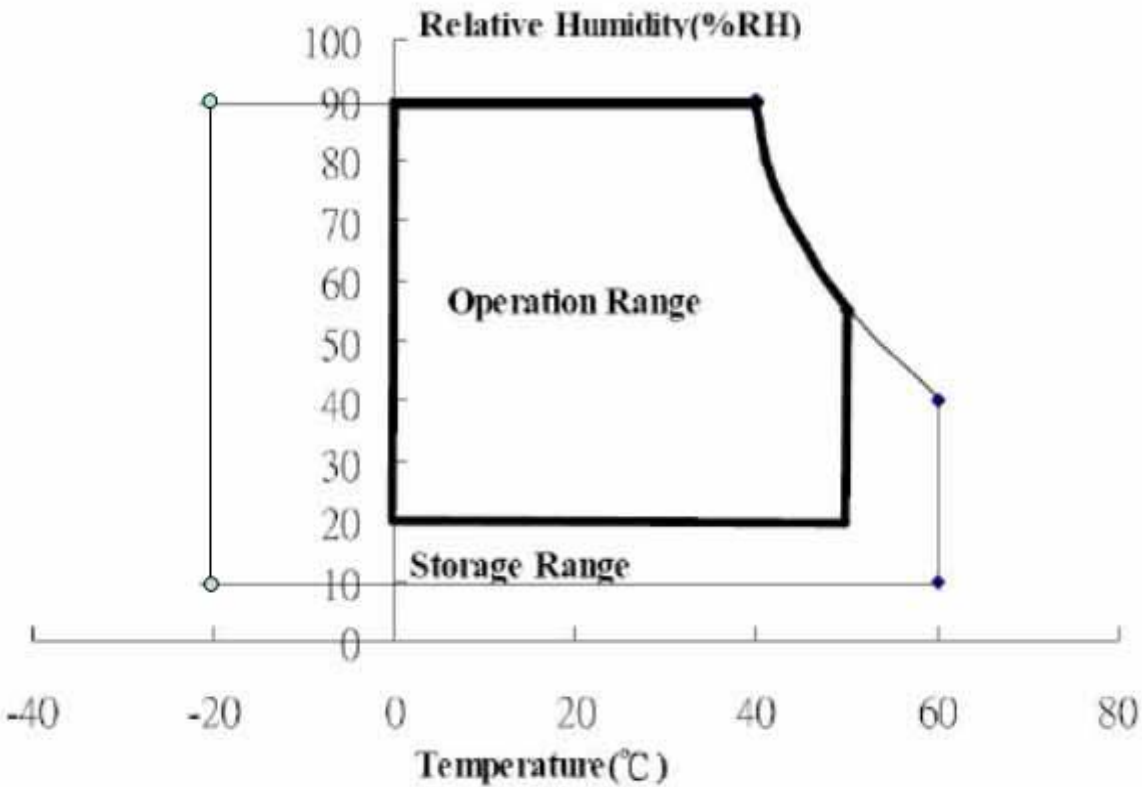


2. Absolute maximum ratings

| Parameter             | Symbol          | Values |      |      | Unit | Remark  |
|-----------------------|-----------------|--------|------|------|------|---------|
|                       |                 | Min.   | Typ. | Max. |      |         |
| Power voltage         | V <sub>cc</sub> | -0.3   | -    | 6.0  | V    | At 25°C |
| Input signal voltage  | V <sub>LH</sub> | -0.3   | -    | 4.3  | V    | At 25°C |
| Operating temperature | Top             | 0      | -    | 50   | °C   | Note 1  |
| Storage temperature   | T <sub>ST</sub> | -20    | -    | 60   | °C   | Note 2  |

Note 1: The relative humidity must not exceed 90% non-condensing at temperatures of 40°C or less.  
At temperatures greater than 40°C, the wet bulb temperature must not exceed 39°C.

Note 2: The unit should not be exposed to corrosive chemicals.



## 3. Electrical characteristics

## a. Typical operating conditions

| Item                                        |                            | Symbol     | Min. | Typ. | Max. | Unit             | Remark |
|---------------------------------------------|----------------------------|------------|------|------|------|------------------|--------|
| Input Voltage                               |                            | $V_{CC}$   | 4.5  | 5    | 5.5  | V                |        |
| Permissive Power Input Ripple               |                            | $V_{RF}$   | -    | -    | 0.15 | V <sub>p-p</sub> |        |
| Input Current                               | Black                      | $I_{CC}$   | -    | 1000 | 1300 | Ma               | Note 1 |
|                                             | White                      | $I_{CC}$   | -    | 700  | 1000 |                  | Note 2 |
|                                             | Mosaic                     | $I_{CC}$   | -    | 900  | 1200 |                  | Note 3 |
| Rush Current                                |                            | $I_{Rush}$ | -    | 1.6  | 3    | A                | Note 4 |
| Logic Input<br>Voltage<br>LVDS:<br>IN+, IN- | Common Mode Voltage        | VCM        | -    | 1.2  | -    | V                |        |
|                                             | Differential Input Voltage | VID        | 100  | -    | 600  | mV               |        |
|                                             | Threshold Voltage (High)   | VTH        | -    | -    | 100  | mV               | Note 5 |
|                                             | Threshold Voltage (Low)    | VTL        | -100 | -    | -    | mV               | Note 5 |

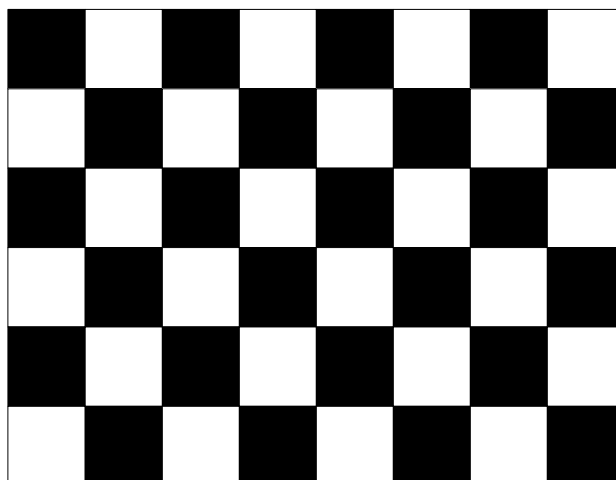
Note 1 : The specified current is under the  $V_{CC}=5V$ , 25 °C,  $f_v=60Hz$  (frame frequency) condition whereas black pattern is displayed.

Note 2 : The specified current is under the  $V_{CC}=5V$ , 25 °C,  $f_v=60Hz$  (frame frequency) condition whereas white pattern is displayed.

Note 3 : The specified current is under the  $V_{CC}=5V$ , 25 °C,  $f_v=60Hz$  (frame frequency) condition whereas mosaic pattern(black & white [8\*6] ) is displayed.

White: 255 Gray

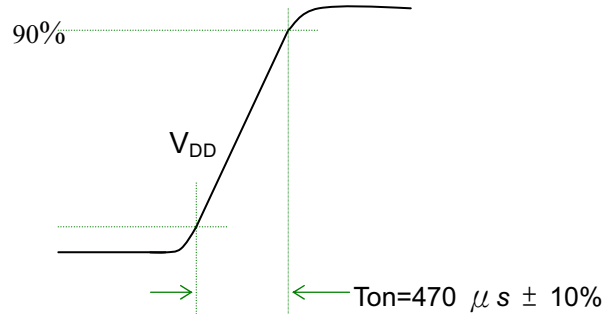
Black: 0 Gray



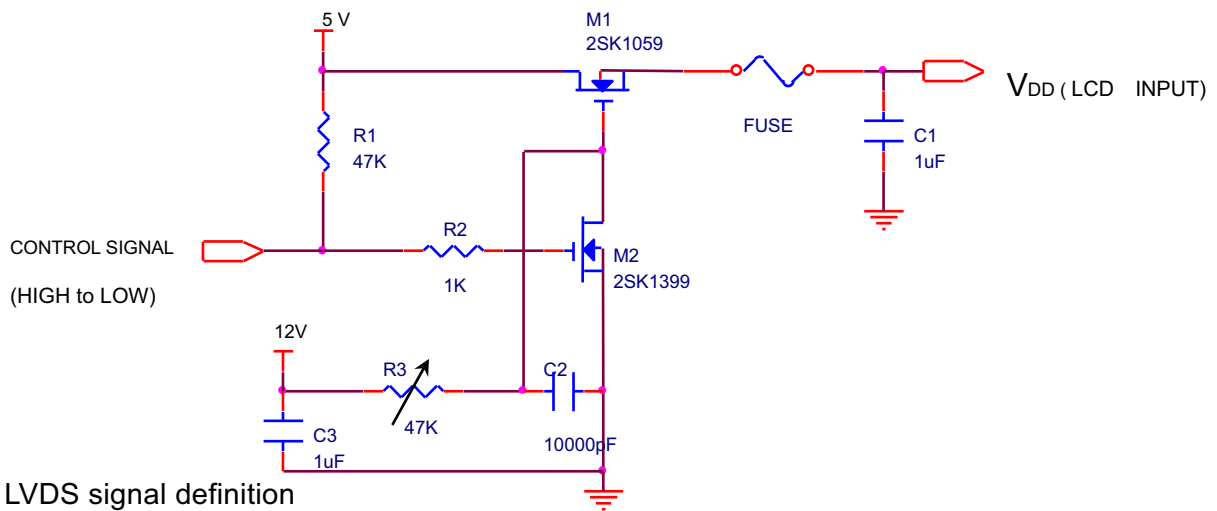
Note 4: test condition :

(1)  $V_{DD} = 5\text{ V}$ ,  $V_{DD}$  rising time =  $470\text{ }\mu\text{s} \pm 10\%$

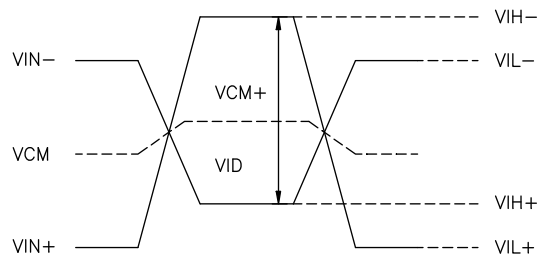
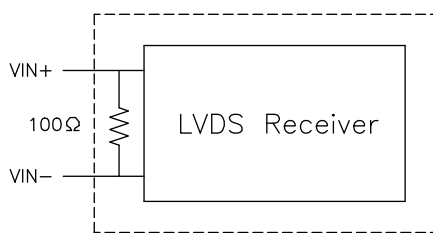
(2) Pattern: Mosaic pattern



(3) Test circuit



Note 5: LVDS signal definition



$VIN_+$  = Positive differential DATA & CLK Input

$VIN_-$  = Negative differential DATA & CLK Input

$VID = VIN_+ - VIN_-$ ,

$\Delta VCM = |VCM_+ - VCM_-|$ ,

$\Delta VID = |VID_+ - VID_-|$ ,

$VID_+ = |VIH_+ - VIH_-|$ ,

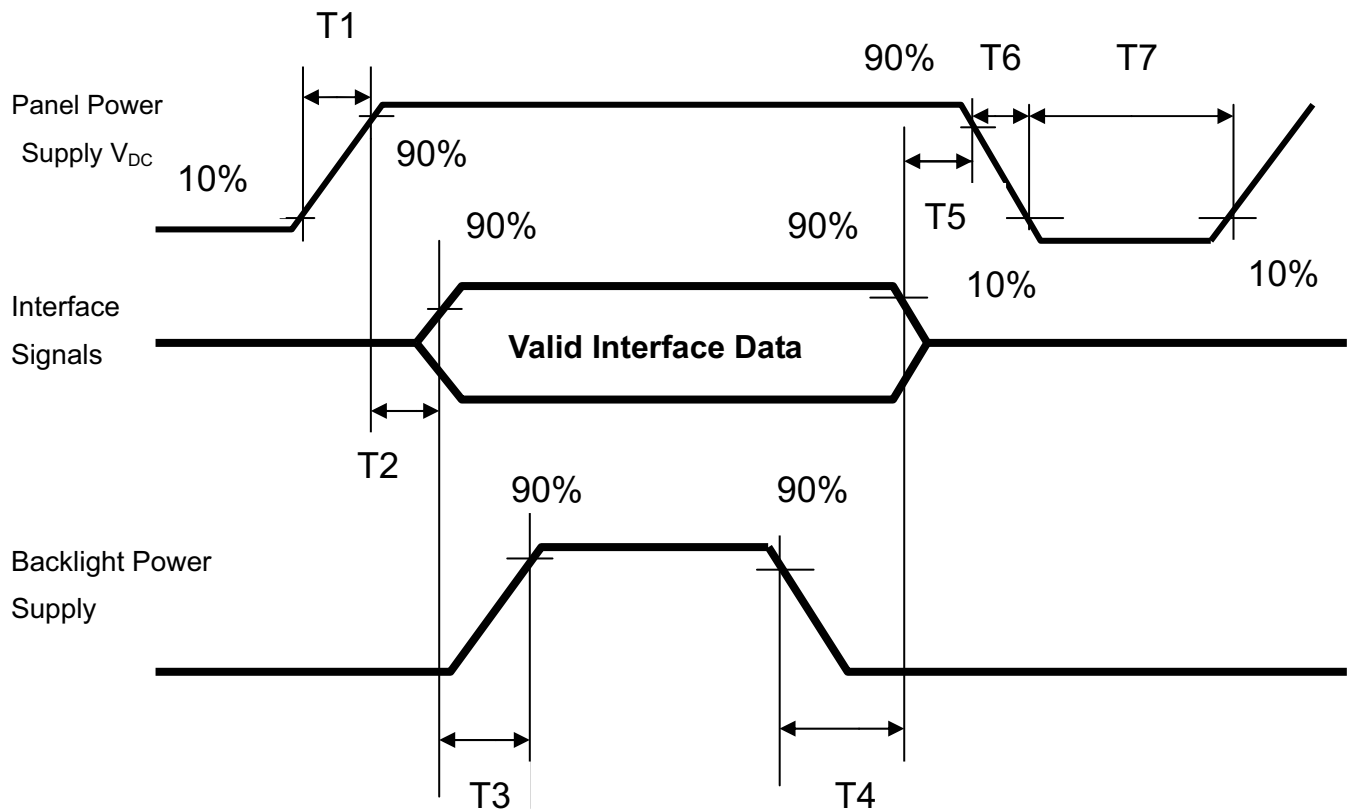
$VID_- = |VIL_+ - VIL_-|$ ,

$VCM = (VIN_+ + VIN_-)/2$ ,

$VCM_+ = (VIH_+ + VIH_-)/2$ ,

$VCM_- = (VIL_+ + VIL_-)/2$ ,

Note 6: Power on sequence for LCD V<sub>DD</sub>



| Parameter | Value |     |     | Unit |
|-----------|-------|-----|-----|------|
|           | Min   | Typ | Max |      |
| T1        | 0.1   | -   | 10  | ms   |
| T2        | 0     | 30  | 50  | ms   |
| T3        | 200   | 250 | -   | ms   |
| T4        | 100   | 250 | -   | ms   |
| T5        | 0     | 20  | 50  | ms   |
| T6        | 0.1   | -   | 50  | ms   |
| T7        | 1000  | -   | -   | ms   |

## b. Display color vs. input data signals

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

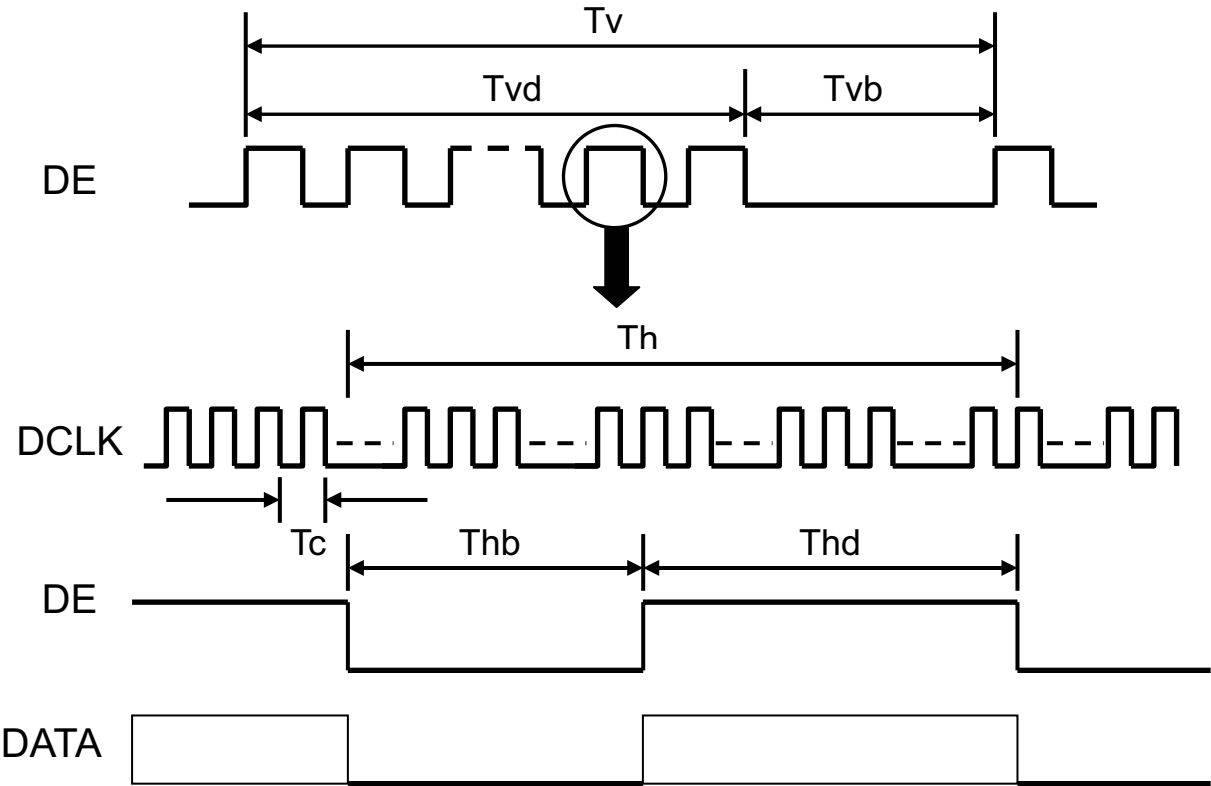
| Color        |                  | Input color data |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |   |   |  |  |  |  |
|--------------|------------------|------------------|----|----|----|-----|----|----|----|-------|----|----|----|-----|----|----|----|------|----|----|----|-----|----|---|---|--|--|--|--|
|              |                  | Red              |    |    |    |     |    |    |    | Green |    |    |    |     |    |    |    | Blue |    |    |    |     |    |   |   |  |  |  |  |
|              |                  |                  |    |    |    |     |    |    |    |       |    |    |    |     |    |    |    |      |    |    |    |     |    |   |   |  |  |  |  |
|              |                  | MSB              |    |    |    | LSB |    |    |    | MSB   |    |    |    | LSB |    |    |    | MSB  |    |    |    | LSB |    |   |   |  |  |  |  |
| R7           | R6               | R5               | R4 | R3 | R2 | R1  | R0 | G7 | G6 | G5    | G4 | G3 | G2 | G1  | G0 | B7 | B6 | B5   | B4 | B3 | B2 | B1  | B0 |   |   |  |  |  |  |
| Basic colors | Black            | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Red(255)         | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Green(255)       | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Blue(255)        | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1 | 1 |  |  |  |  |
|              | Cyan             | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1   | 1  | 1 | 1 |  |  |  |  |
|              | Magenta          | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1 | 1 |  |  |  |  |
|              | Yellow           | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | White            | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1   | 1  | 1 | 1 |  |  |  |  |
| Red          | Red(000) dark    | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Red(001)         | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Red(002)         | 0                | 0  | 0  | 0  | 0   | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | :                | :                | :  | :  | :  | :   | :  | :  | :  | :     | :  | :  | :  | :   | :  | :  | :  | :    | :  | :  | :  | :   | :  | : | : |  |  |  |  |
|              | Red(253)         | 1                | 1  | 1  | 1  | 1   | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Red(254)         | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Red(255) bright  | 1                | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
| Green        | Green(000)dark   | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Green(001)       | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Green(002)       | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | :                | :                | :  | :  | :  | :   | :  | :  | :  | :     | :  | :  | :  | :   | :  | :  | :  | :    | :  | :  | :  | :   | :  | : | : |  |  |  |  |
|              | Green(253)       | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Green(254)       | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Green(255)bright | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
| Blue         | Blue(000) dark   | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 0 |  |  |  |  |
|              | Blue(001)        | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 0 | 1 |  |  |  |  |
|              | Blue(002)        | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0   | 0  | 1 | 0 |  |  |  |  |
|              | :                | :                | :  | :  | :  | :   | :  | :  | :  | :     | :  | :  | :  | :   | :  | :  | :  | :    | :  | :  | :  | :   | :  | : | : |  |  |  |  |
|              | Blue(253)        | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 0 | 1 |  |  |  |  |
|              | Blue(254)        | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1 | 0 |  |  |  |  |
|              | Blue(255) bright | 0                | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1   | 1  | 1 | 1 |  |  |  |  |

c. Input signal timing  
Support Input Timing Table

|            | Item           | Description          | Min.  | Typ.  | Max. | Unit           |
|------------|----------------|----------------------|-------|-------|------|----------------|
| Clock      | Dclk           | period               | 11.43 | 13.89 | 16.7 | nS             |
|            |                | frequency            | 60    | 72    | 87.5 | MHz            |
| Vertical   | $T_{V\_TOTAL}$ | V total line number  | 1090  | 1100  | 1160 | $T_{H\_TOTAL}$ |
|            | $T_{V\_DATA}$  | Data duration        | —     | 1080  | —    | $T_{H\_TOTAL}$ |
|            | $T_{VB}$       | V-blank              | 10    | 20    | 80   | $T_{H\_TOTAL}$ |
|            | $f_V$          | frequency            | 50    | 60    | 75   | Hz             |
| Horizontal | $T_{H\_TOTAL}$ | H total pixel number | 1000  | 1088  | 1120 | DClk           |
|            | $T_{H\_DATA}$  | Data duration        | —     | 960   | —    | DClk           |
|            | $T_{HB}$       | H-blank              | 40    | 128   | 160  | DClk           |

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low Logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



## d. Display Position

|           |           |        |             |        |              |              |
|-----------|-----------|--------|-------------|--------|--------------|--------------|
| D(1,1)    | D(2,1)    | ... .. | D(960,1)    | ... .. | D(1919,1)    | D(1920,1)    |
| D(1,2)    | D(2,2)    | ... .. | D(960,2)    | ... .. | D(1919,2)    | D(1920,2)    |
| .         | .         | ... .. | .           | ... .. | .            | .            |
| D(1,540)  | D(2,540)  | ... .. | D(960,540)  | ... .. | D(1919,540)  | D(1920,540)  |
| .         | .         | ... .. | .           | ... .. | .            | .            |
| D(1,1079) | D(2,1079) | ... .. | D(960,1079) | ... .. | D(1919,1079) | D(1920,1079) |
| D(1,1080) | D(2,1080) | ... .. | D(960,1080) | ... .. | D(1919,1080) | D(1920,1080) |

## e. Backlight Unit

| Parameter               | Symbol | Min.   | Typ.   | Max.  | Unit             | Note        |
|-------------------------|--------|--------|--------|-------|------------------|-------------|
| Light Bar Input voltage | VLED   | -      | 36.3   | 37.4  | VDC              | (Duty 100%) |
| Light Bar Input current | ILED   | -      | 360    | 396   | mA <sub>DC</sub> | Note 1,2,3  |
| Power Consumption       | PLED   | -      | 13.07  | 14.81 | W                | Note 4      |
| LED life time           | LBL    | 25,000 | 30,000 | -     | Hrs              | Note 5      |

Note 1: There are two Light Bars, and the specified current is input LED chip 100% duty current.

Note 2: The sensing current of each string is 60mA.

Note 3: Each light bar have three current sensing strings, so that each light bar input current is 180mA.

Note 4:  $P_{LED} = I_{LED} \times V_{LED}$ .

Note 5: The life time is determined as the time at which luminance of the LED becomes 50% of the initial brightness or not normal lighting at  $I_{LED}=360\text{mA}$  on condition of continuous operating at  $25\pm 2^{\circ}\text{C}$ .

**C. Optical specifications**

| Item                    | Symbol     | Condition          | Specification |       |       | Unit | Remark     |
|-------------------------|------------|--------------------|---------------|-------|-------|------|------------|
|                         |            |                    | Min.          | Typ.  | Max.  |      |            |
| Response time           | Tr         | $\theta = 0^\circ$ | -             | 1.5   | 3     | ms   | Note 4     |
|                         | Tf         |                    | -             | 3.5   | 7     |      |            |
|                         | Tr+Tf      |                    | -             | 5     | 10    |      |            |
| Contrast ratio          | CR         | $\theta = 0^\circ$ | 700           | 1000  | -     |      | Note 3,5   |
| Viewing angle           | Top        | $CR \geq 10$       | 70            | 80    | -     | deg. | Note 3,5,6 |
|                         | Bottom     | $CR \geq 10$       | 70            | 80    | -     |      |            |
|                         | Left       | $CR \geq 10$       | 75            | 85    | -     |      |            |
|                         | Right      | $CR \geq 10$       | 75            | 85    | -     |      |            |
| Brightness (Center)     | YL         | -                  | 250           | 300   | -     | nits | Note 3     |
| Color chromaticity(CIE) | Wx         | $\theta = 0^\circ$ | -0.03         | 0.313 | +0.03 |      | Note 3     |
|                         | Wy         |                    |               | 0.329 |       |      |            |
|                         | Rx         |                    |               | 0.640 |       |      |            |
|                         | Ry         |                    |               | 0.345 |       |      |            |
|                         | Gx         |                    |               | 0.324 |       |      |            |
|                         | Gy         |                    |               | 0.619 |       |      |            |
|                         | Bx         |                    |               | 0.150 |       |      |            |
|                         | By         |                    |               | 0.059 |       |      |            |
| White uniformity (9)    | $\delta_w$ | -                  | 0.70          | 0.75  | -     |      | Note 3,7   |
| Cross talk(In 60HZ)     | Ct         | -                  | -             | -     | 2.0%  |      | Note 8     |

Note 1: Ambient temperature = 25°C.

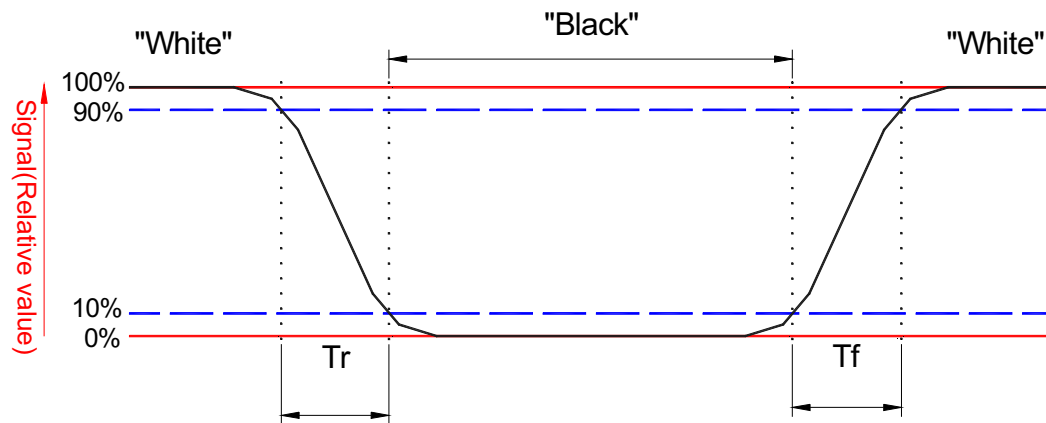
Note 2: To be measured in dark room after backlight warm up 30 minutes.

Note 3: To be measured with a viewing cone of 2° by Topcon luminance meter BM-5A.

Note 4: Definition of response time:

The output signals of BM-7 are measured when the input signals are changed from “Black” to “White” (falling time) and from “White” to “Black” (rising time), respectively. The response time interval is between the 10% and 90% of amplitudes. Refer to figure as below.



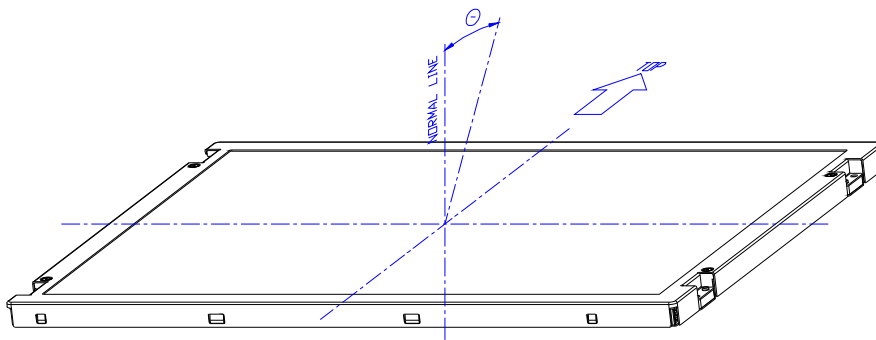


Note 5: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

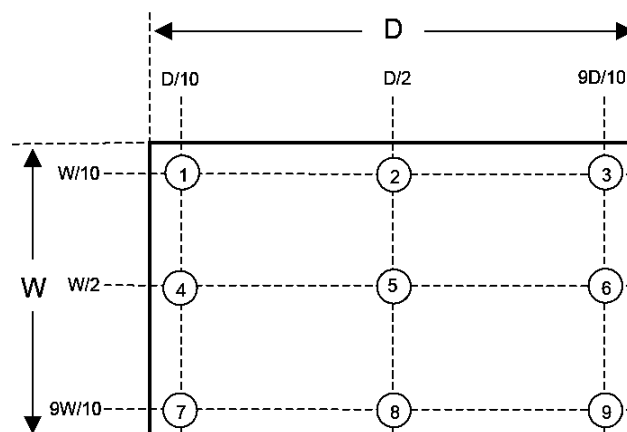
Note 6: Definition of viewing angle



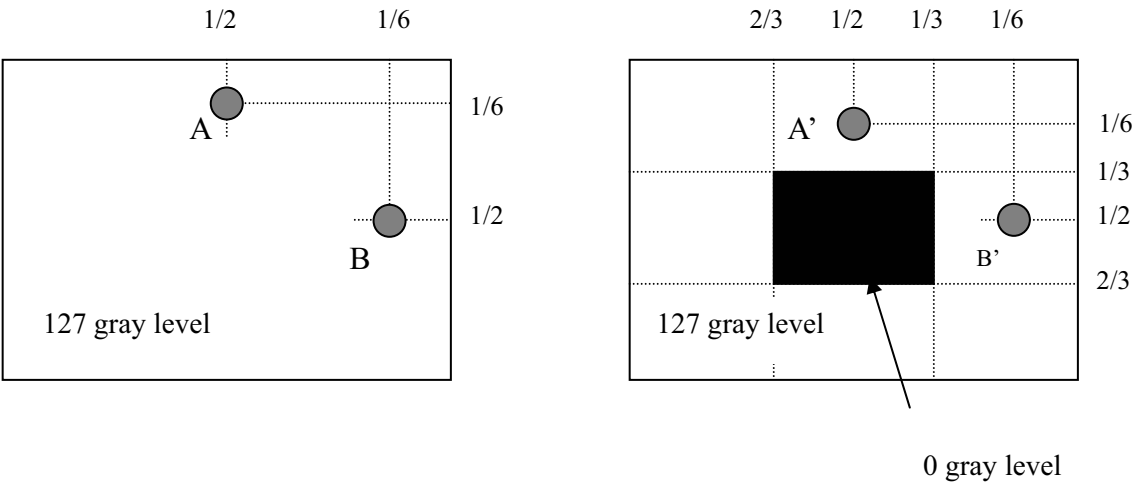
Note 7: Definition white uniformity:

Luminance are measured at the following nine points (P1~P9).

$$\delta_w = \frac{\text{Minimum Brightness of nine points (P1~P9)}}{\text{Maximum Brightness of nine points (P1~P9)}}$$



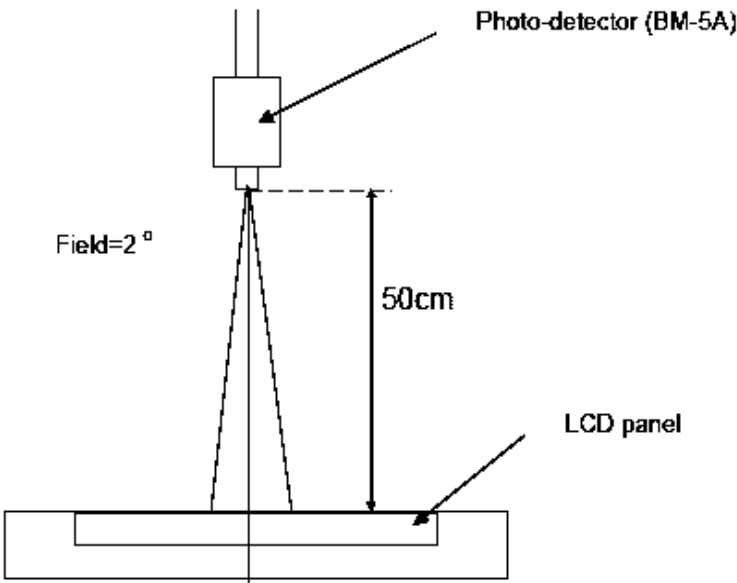
Note 8:



$|L_A - L_{A'}| / L_A \times 100\% = 2\% \text{ max.}$ ,  $L_A$  and  $L_{A'}$  are brightness at location A and A'

$|L_B - L_{B'}| / L_B \times 100\% = 2\% \text{ max.}$ ,  $L_B$  and  $L_{B'}$  are brightness at location B and B'

Note 10: Optical characteristic measurement setup.



**D.Reliability test items**

| Test Item                                        | Test Condition                                                                                                                                                                   | Judgment | Remark |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|
| High temperature storage                         | 60°C, 240Hrs                                                                                                                                                                     | Note 1   | Note 2 |
| Low temperature storage                          | -20°C, 240Hrs                                                                                                                                                                    | Note 1   | Note 2 |
| High temperature & high humidity operation       | 40°C, 90%RH, 240Hrs<br>(No condensation)                                                                                                                                         | Note 1   | Note 2 |
| High temperature operation                       | 50°C, 240Hrs                                                                                                                                                                     | Note 1   | Note 2 |
| Low temperature operation                        | 0°C, 240Hrs                                                                                                                                                                      | Note 1   | Note 2 |
| Thermal Shock<br>(non-operation)                 | -20°C~60°C<br>-20°C /1Hr, 60°C /1Hr, 100cycles                                                                                                                                   | Note 1   | Note 2 |
| Electrostatic discharge (ESD)<br>(non-operation) | Contact: +/-8kV, 150pF(330ohms),<br>10 times/1 point, 1 time/1 sec, total 16 points<br>Air discharge: +/-15kV, 150pF(330ohms), 10<br>times/1 point, 1 time/1 sec, total 9 points | Note 1   | Note 2 |
| Vibration<br>(non-operation)                     | Vibration level : 1.5G<br>Bandwidth : 10-300Hz<br>Waveform : sine wave,<br>sweep rate : 10min<br>30 min for each direction X, Y, Z<br>(1.5 Hrs in total)                         | Note 1   | Note 2 |
| Mechanical Shock<br>(non-operation)              | Shock level : 50G, 11ms<br>Waveform : Half sine wave<br>Direction : ±X, ±Y, ±Z<br>One time each direction                                                                        | Note 1   | Note 2 |
| MTBF Demonstration                               | 25000 hours with confidence level 90%                                                                                                                                            | Note 1   | Note 3 |

Note1: Pass: Normal display image with no obvious non-uniformity and no line defect.

Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

Note2: Evaluation should be tested after storage at room temperature for two hours.

Note 3: The MTBF calculation is based on the assumption that the failure rate distribution meets the Exponential Model (CCFL excluded).

**E. Safety****(1) Sharp Edge Requirements**

There will be no sharp edges or corners on the display assembly that could cause injury.

**(2) Materials****a. Toxicity**

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible InnoLux Toxicologist.

**b. Flammability**

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process. The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

**c. Capacitors**

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

**F. Display quality**

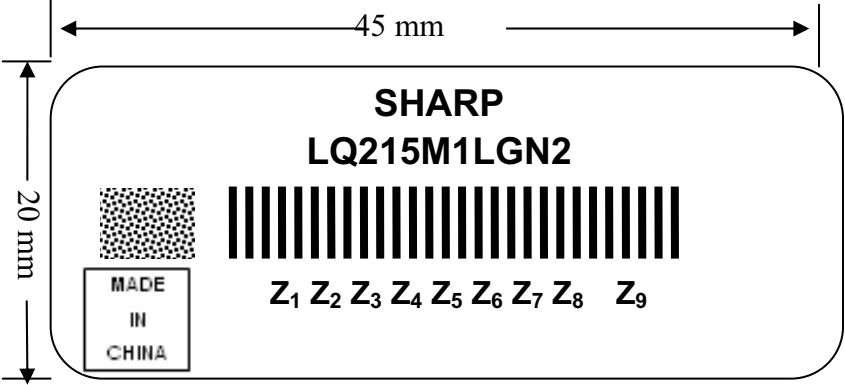
The display quality of the color TFT-LCD module should be in compliance with the Innolux's Incoming inspection standard.

**G. Handling precaution**

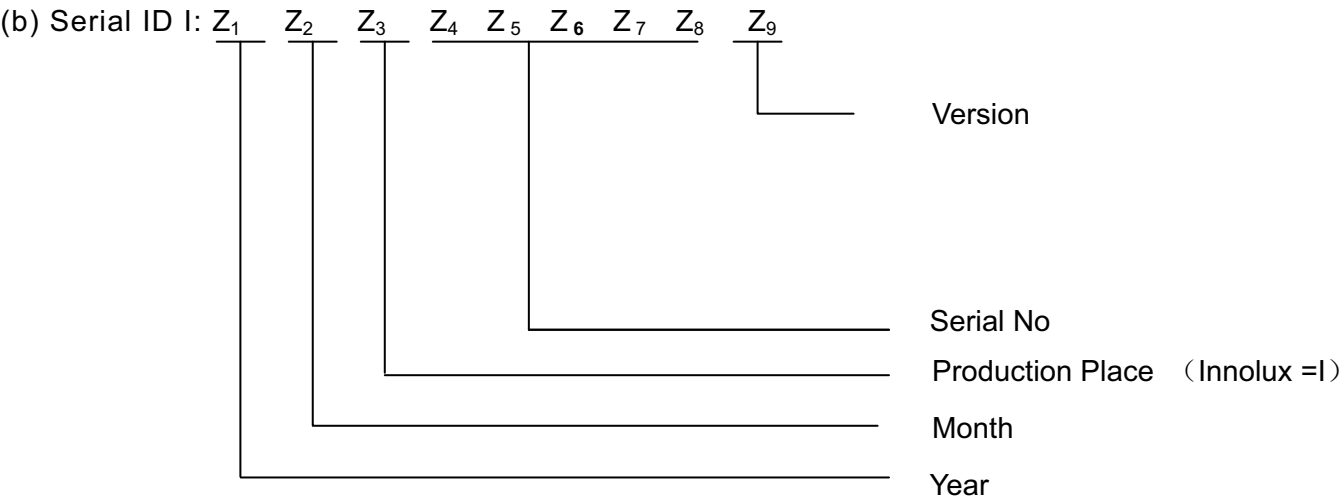
The Handling of the TFT-LCD should be in compliance with the Innolux's handling principle standard.

H. Label

(1) Module Label



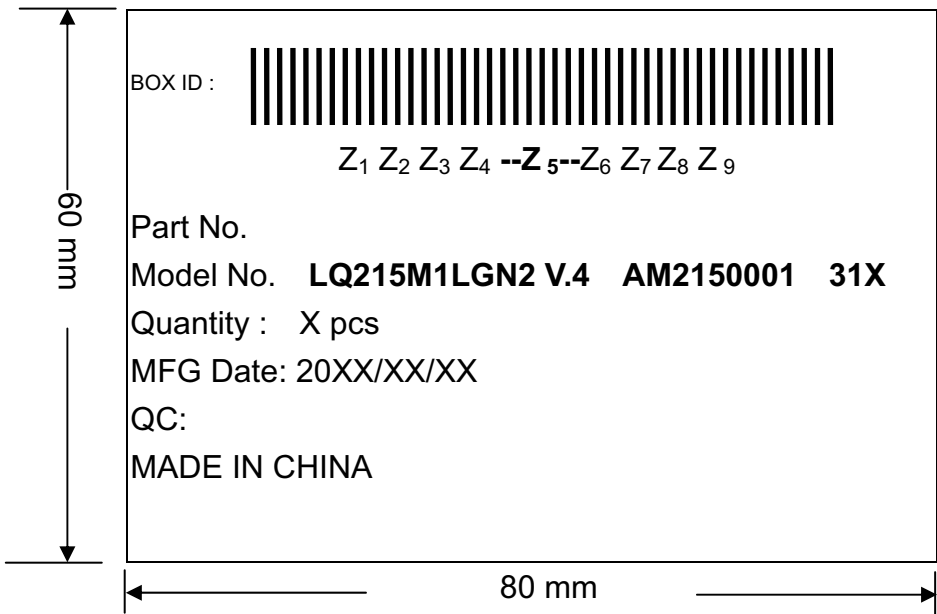
(a) Model Number: LQ215M1LGN2 (Sharp assigned)



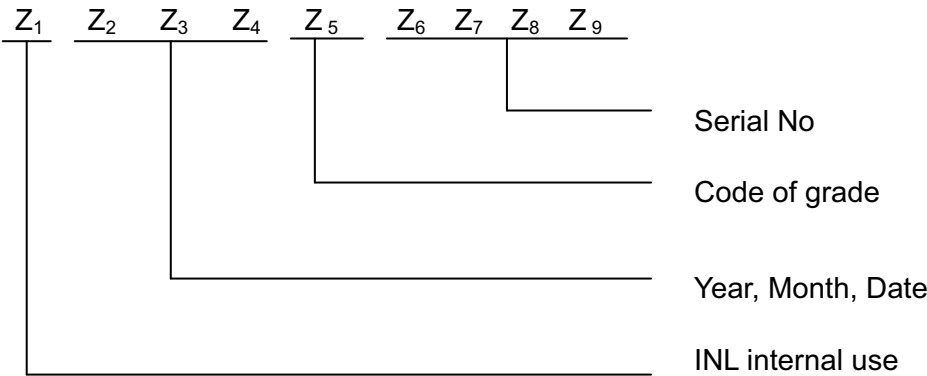
Serial ID includes the information as below:

1. Year: Final digit of the A.D. EX."9" for2009
2. Month: 1~9, X, Y and Z. (X=Oct. Y=Nov. Z=Dec.)
3. Production Place (Innolux =I)
4. Serial No: 0~99999, Over 10Kpcs use A, B, C...  
For example: Actual                      Print  
                    99,999                      99999  
                    100,000~                      A0000~  
                    110,000~                      B0000~  
                    120,000~                      C0000~
5. Version: The first Version is A, version changes with design change.  
Version with 26 letters, For example: A, B, C...

(2) Carton Label\_INL



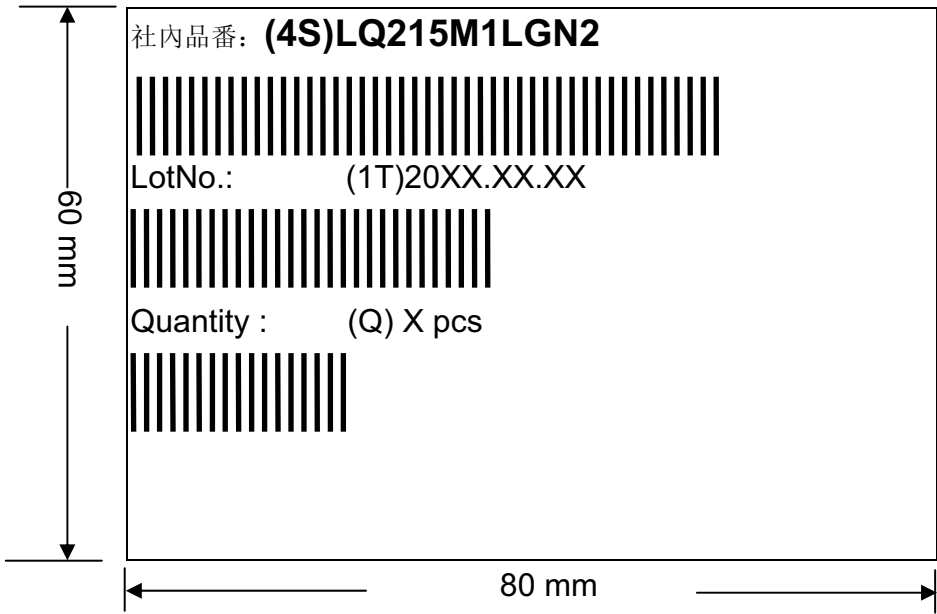
- (a) Model Name: SharpLQ215M1LGN2 ; INL :MT215DW01
- (b) Version: Sharp : V.4 ; INL :V.3
- (c) Packing quantity: 8 pcs
- (d) Serial ID:  $Z_1 Z_2 Z_3 Z_4 Z_5 Z_6 Z_7 Z_8 Z_9$



Serial ID includes the information as below:

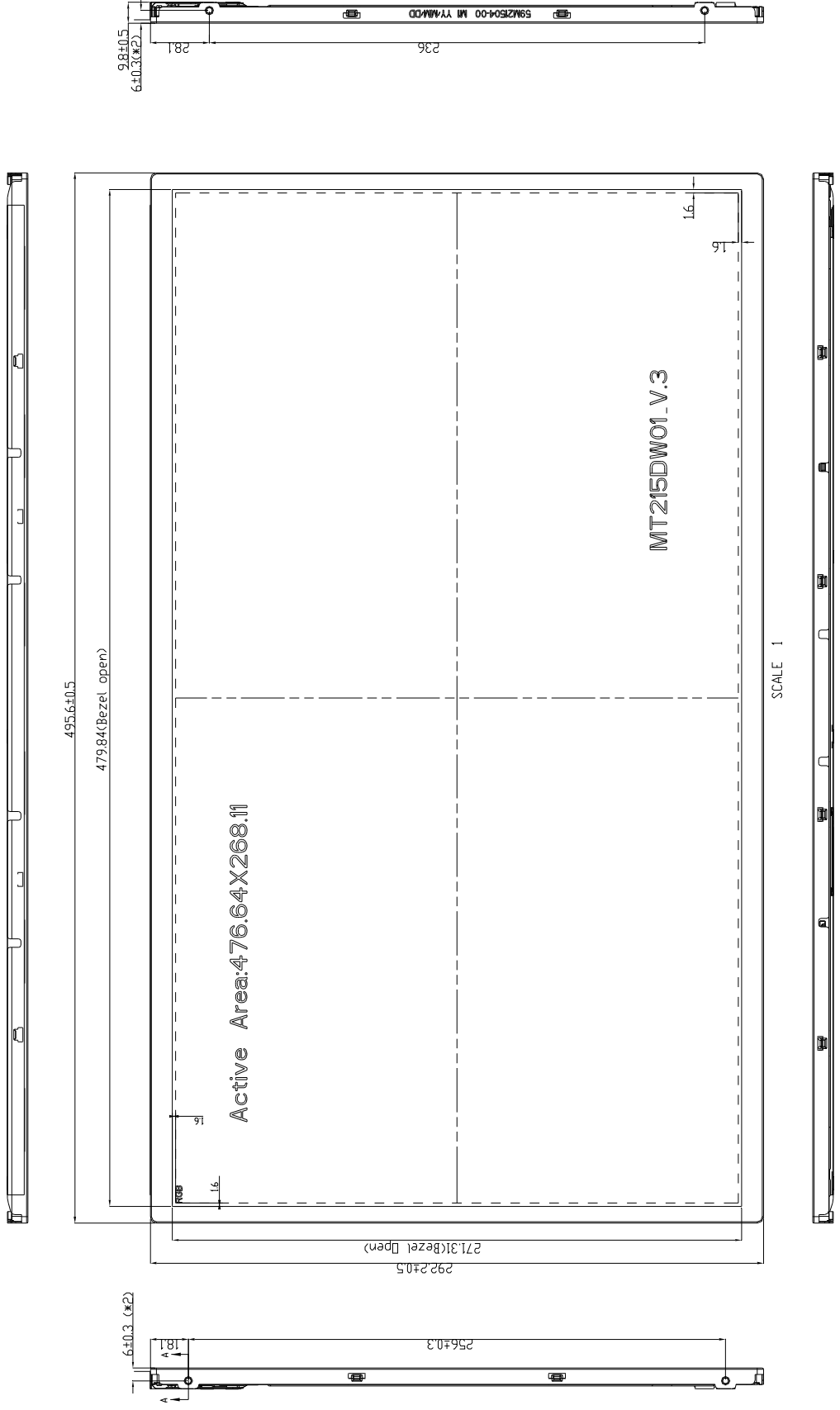
- (a) Manufactured Date: Year: 0~9, for 2000~2009  
Month: 1~9 & A~C for Jan.~Dec.  
Date: 1~9 & A~Z (exclude I, O, Q, U) for 1st~31th
- (b) Code of grade: 1,2, 3, 5, E
- (c) Serial No: Module packing sequence no

(3) Carton Label\_Sharp



- (a) Sharp Model Name: LQ215M1LGN2 (Sharp assigned)
- (b) Lot No.: Year: 0~9, for 2000~2009  
Month: 1~9 & A~C for Jan.~Dec.  
Date: 1~9 & A~Z (exclude I, O, Q, U) for 1st~31th
- (c) Packing quantity: 8pcs

I. ME Drawing  
(1) Front view



4X M3 User Holes  
Max Length=4.8mm

Gap Max 0.5mm

SECTION A-A  
SCALE 3

NOTE:  
1.THE DIMENSION EXCLUDES DEFORMATION  
2.Backlight has 2 LED PKG ASS'Y  
3.TOLERANCE WITHOUT NOTICED TO BE ±0.5MM  
AND JUST RESCREW 10 TIMES

SCALE 1



(2) Back view

